ber, and consisting of two parts, an astronomical and an astrological.

The Journal of the Russian Chemical and Physical Societies of St. Petersburg (vol. x. No. 8) contains the following papers:—On the chlorides of benzol, by Th. Beilstein and A. Kourbatoff.—On the preparation of glycol, by S. Stempnevsky.—On allyldipropylcarbinol, by P. and A. Saytzeff.—On pseudopropylacetylene, by F. Flavitzky and P. Kriloff.—Remarks by F. Flavitzky on M. Eltekoff's paper on the action of water upon the chlorides of ethylenes and similar compounds in the presence of oxide of lead.—Observations on nitrophenols, by M. Goldstein.—On the nature and the derivates of cholesterine, by M. Valitzky.—On the neutral products of the oxidation of cholesterine, by P. Latschinoff.—On the polarisation of electrolytes, by R. Colly.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December.—"Note on the Influence exercised by Light on Organic Infusions," by John Tyndall, D.C.L., F.R.S., Professor of Natural Philosophy in the Royal Institution.

Early last June I took with me to the Alps fifty small hermetically sealed flasks containing infusion of cucumber, and fifty containing turnip infusion. Before sealing they had been boiled for five minutes in the laboratory of the Royal Institution. They were carefully packed in sawdust, but when unpacked the fragile sealed ends of about twenty of them were found broken off. Some of these injured flasks were empty, while others still retained their liquids. The eighty unbroken flasks were found pellucid, and they continued so throughout the summer. All the broken ones, on the other hand, which had retained their liquids, were turbid with organisms.

Shaking up the sawdust, which I knew must contain a considerable quantity of germinal matter, I snipped off the ends of a number of flasks in the air above the sawdust. Exposed to a temperature of 70° or 80° F., the contents of all these flasks became turbid in two or three days.

The experiment was repeated; and after the contaminated air had entered them, I exposed the flasks to strong sunshine for a whole summer's day; one batch, indeed, was thus exposed for several successive days. Placed in a room with a temperature of from 70° to 80° F., they all, without exception, became turbid with organisms.

Another batch of flasks, after having their sealed ends broken off, was infected by the water of a cascade derived from the melting of the mountain snows. They were afterwards exposed to a day's strong sunshine, and subsequently removed to the warm room. In three days they were thickly charged with organisms.

On the same day a number of flasks had their ends snipped off in the open air beside the cascade. They remained for weeks transparent, and doubtless continue so to the present hour.

I do not wish to offer these results as antagonistic to those so clearly described by Dr. Arthur Downes and Mr. Thomas Blunt, in the *Proceedings* of the Royal Society for December 6, 1877. Their observations are so definite that it is hardly possible to doubt their accuracy. But they noticed anomalies which it is desirable to clear up. On July 10, for example, they found 9 hours' exposure to daylight, 3½ hours of which only were hours of sunshine, sufficient to effect sterilisation; while, on July 29, "a very hot day, with much sunshine," 11 hours' exposure "9 of which were true insolation," failed to produce the same effect. Such irregularities, coupled with the results above recorded, will, I trust, induce them to repeat their experiments, with the view of determining the true limits of the important action which those experiments reveal.

Chemical Society, December 19.—Dr. Gladstone, president, in the chair.—The following papers were read:—Researches on the action of the copper zinc couple on organic bodies, part ix.—Preparation of zinc methyl, by Dr. Gladstone and Mr. Tribe. (During the reading of this paper Dr. Frankland took the chair.) Methyl iodide in contact with the copper zinc couple is converted at the ordinary temperature, in from three to thirty days, into a crystalline mass of zinc methiodide. By distillation zinc methyl is obtained; the yield in one case was 99·27.—Dr. Debus made some remarks on the formula of glyoxylic acid. The author considers the formula of this acid to be $C_2H_2O_3$, in opposition to Perkin, who from quantitative experiments came to the conclusion that the true formula was $C_2H_4O_4$.—Mr. Wills gave a short communication on the production of oxides of nitrogen by the electric arc in air. The author finds that nitric acid was formed in four experiments equivalent to ·54, ·55, ·6, and ·7 gramme per hour, and points out the importance of this observation with reference to the proposed use of the electric light in dwellings.—On the action of alkaline hypobromite on oxamide, urea, and potassium ferrocyanide, part ii., by W. Foster.—On two new hydrocarbons obtained by the action of sodium on turpentine hydrochloride, by Dr. Letts. The principal point in this paper is the fact that the author has obtained a solid hydrocarbon having the formula $C_{10}H_{17}$, which he designates solid turpenyl.—On the formation of baric periodate, by S. Sugiura and C. F. Cross.—On erbium and yttrium, by T. S. Humpidge and W. Burney. The authors wished to determine the specific heats of these metals, but failed to obtain them in coherent masses. They determined the atomic weight of pure erbium to be 171·61.

Meteorological Society, December 18.—Mr. C. Greaves, president, in the chair.—P. Doyle, F.S.S., J. M. Gray, Lord Hampton, G.C.B., M. Jackson, A. Proctor, G. Simpson, and E. C. Tisdall were elected Fellows of the Society.—The following papers were read:—Abstract of the meteorology of the Bombay Presidency, by C. Chambers, F.R.S., communicated by Sir G. B. Airy, K.C.B., F.R.S., Astronomer-Royal.—Experiments with Lowne's anemometer, by Capt. William Watson, F.M.S.—Meteorology of Bangkok, Siam, by J. Campbell, Staff Surgeon, R.N.—Results of meteorological observations taken at Calvinia, South Africa, by Kaufmann I. Marks, F.M.S.

Royal Microscopical Society, December 11.—Dr. C. J. Hudson, vice-president, in the chair.—Mr. John Harrison and Dr. Alabone were elected Fellows of the Society.—Dr. Hudson described a new species of Rotifer, *Oecistes sphagni*, coloured drawings of which were exhibited. He also exhibited a number of beautiful transparent diagrams of rare species of Infusoria which he described seriatim.—Mr. F. H. Ward read a paper on a new microspectroscope without a slit, and described this and other accessory apparatus to the instrument.—Mr. F. Crisp read a paper on Hoffmann's new camera lucida, in which he described this and other recent forms of the apparatus, figures of some being drawn upon the board. Another form of camera lucida, by Dr. Russell, of Lancaster, was described and figured by Dr. Millar, and a description of a new one by Swift was also given by Mr. Ingpen.—Mr. C. Stewart read a short communication from Mr. A. D. Michael announcing the discovery of the male of *Cheyletus venustissimus*. Attention was called to a new glycerine immersion lens received from America, by Mr. Ingpen.—Mr. Beck, in reference to a suggestion for a universal unit of microscopical measurement, gave his decision in favour of divisions of the millimetre, and presented to the Society a micrometer ruled with this, and also in $\frac{1}{1000}$ inch, for ready comparison.

Geological Society, December 18, 1878.—Henry Clifton Sorby, F.R.S., president, in the chair.—Rev. Frederick Charles Lambert, Robert Plant, and Ernest Swain were elected Fellows of the Society.—The following communications were read:—On remains of *Mastodon* and other vertebrata of the miocene beds of the Maltese Islands, by Prof. A. Leith Adams, F.R.S. The author recognised the following Maltese formations:—Upper Limestone.—Maximum thickness over 250 feet, passing into a sandy rock, and that into a hard red limestone. Fossiliferous, containing four Brachiopoda, several Lamellibranchs and Gasteropods, and twenty-five Echinodermata (ten being peculiar). Sand Bed.—Maximum thickness about 60 feet, variable in character, characterised by vast abundance of *Heterostegina depressa*; fifteen vertebrata. The Marl Bed.—Maximum thickness over 100 feet, but sometimes almost wholly thinned out. Organic remains rarer than in the sand bed. The Calcareous Sandstone.—Maximum thickness rather over 200 feet. Contains bands of nodules, of which the second is rich in organic remains. Hence come the noted teeth of Squalidæ. Among its invertebrate fauna are many Pecteus, with other Lamellibranchs, Gasteropods, and Brachiopods. Also twenty-two species of Echinodermata. The Lower Limestone.—Maximum thickness over 400 feet. *Scutella subrotunda* and *Orbitoides despansus* are abundant in the upper part, and it is generally fossiliferous. In a nodule-seam in the calcareous sandstone in the Island of Gozo two rather imperfect teeth of a *Mastodon* have been found. Both are penultimate molars. They agree most

nearly with the teeth of *Mastodon angustidens*, but the characters are not sufficiently well preserved to differentiate the species with certainty. The same formation has furnished teeth of a *Phoca*, to which the specific name *rugosidens* has been given by Prof. Owen. Large teeth referable to the Phocidæ are found in the nodule seams of the calcareous sandstone and in the sand bed; the marl bed has also furnished a portion of a jaw. The Woodwardian Museum contains a part of a jaw of *Squalodon*, evidently from a nodule-seam of the calcareous sandstone (found by Scilla circ. 1670). The sand bed and calcareous sandstone have furnished remains of more than one species of *Delphinus*, and large-sized Cetacean vertebræ are found in nearly all the beds, especially the sand bed. *Halitherium* has been obtained from the sand bed, marl bed, calcareous sandstone, lower limestone, and (?) upper limestone. One specimen of *Ichthyosaurus gaudensis*, Hulke, has been furnished by the calcareous sandstone; the same has also furnished *Melitosaurus champsoides*, *Crocodilus gaudensis*, and *Sterrodus melitensis*. *Myliobates toliapicus* and allied species have come from all the deposits except the upper limestone. *Otobates subconversus* from the sand bed and marl. The squalidæ are abundant from all the deposits except the first. There are ten species belonging to the following genera:—*Carcharodon*, *Carcharias*, *Oxyrhina*, *Hemipristis*, *Corax*, *Odontaspis*, *Lamna*. Remains of *Notidanus*, *Platax*, and *Diodon* have also been found.—Dinosauria of the Cambridge greensand, Parts I.–VII., by Prof. H. G. Seeley, F.L.S. F.G.S. The author stated that this paper was founded upon the collection of more than 500 dinosaurian bones preserved in the Woodwardian Museum, for the opportunity of studying which he was indebted to the kindness of Prof. T. McKenny Hughes. He described the conditions under which the specimens occur, and accounted for the apparently worn state of the bones as the results of exposure to the air, and subsequent maceration.—I. Note on the axis of a dinosaur from the Cambridge greensand.—II. On the vertebral characters of *Acanthopholis horridus*, Huxley, from the base of the chalk-marl near Folkestone.—III. On the skeleton of *Anoplosaurus curtonotus*, Seeley.—IV. On the axial skeleton of *Eucercosaurus tanyspondylus*, Seeley.—V. On the skeleton of *Syngonosaurus macrocercus*, Seeley.—VI. On the dorsal and caudal vertebræ of *Acanthopholis stereocercus*, Seeley.—VII. On a small series of caudal vertebræ of a dinosaur, *Acanthopholus eucercus*, Seeley.

CAMBRIDGE

Philosophical Society, November 18.—Prof. Liveing, president, in the chair.—The following communication was made to the Society:—Some results of the two last total solar eclipses, by Dr. A. Schuster. Every scientific investigation passes through a preliminary stage, in which a general survey of the facts is taken, and by means of which the most hopeful line for future inquiry is determined. Eclipse observations may be said to have just passed through that preliminary stage. The present is therefore a fitting time for a general survey of what has been done, and a discussion of what remains to be done. Eclipse observations may be divided into three classes: spectroscopic observations, polariscopic observations, and general observations on the outline and shape of the corona, which can best be carried on by means of good photographs. 1. Spectroscopic observations.—The spectrum of the corona consists: of a continuous spectrum, in which the dark Fraunhofer lines are faintly seen; of the spectrum of hydrogen gas, and of an unknown line in the green. The pressure of a continuous spectrum indicates the presence of solid or liquid particles, and is most likely partly due to matter falling into the sun. During the last eclipse the first systematic attempt to determine the height to which the continuous spectrum extends was made by Prof. Eastman, assisted by Mr. Pritchett. The result was rather remarkable, for although the corona was not equal in intensity in the four directions, the spectrum disappeared nearly at the same distance all round the sun. The importance of obtaining photographs of the spectrum was pointed out. The various attempts that have been made were mentioned, and the result of the Siamese photographs was compared with that of a photograph of the spectrum obtained by Dr. Henry Draper during the late eclipse. The comparison proves that during the late eclipse, the line spectrum was much fainter. All observers agree on this fact, and Prof. Young's opinion, which is decisive on that point, was quoted. The idea of connecting this fact with the minimum of sun-spots through which we are at present passing is obvious. 2. Polariscopic observations.—Polariscopic observations tend to show that close to the sun the polarisation is small, that it increases up to a distance of a few minutes, and then rapidly diminishes. The author has made a calculation as to what the polarisation ought to be, and has come to the result that in whatever way the scattering matter is distributed, as long as it vanishes nowhere, the polarisation ought rapidly to increase with the distance from the sun. The only way to account for the discrepancy between this result and the actual fact is by assuming that as we move away from the sun, more light is reflected in the ordinary way and less light is scattered. Matter falling into the sun and being gradually broken up by the heat would account for all the facts. 3. General outline of the corona.—It has often been remarked that the corona shows an approximate symmetry round the sun's axis. The author supports the view that the greater extension in the direction of the sun's equator is due to meteor streams which approximately circulate in that plane. He quotes in support of this a fact noticed by him during several eclipses, which indicates that a certain departure from this symmetry takes place in such a way that the corona is wider and more extended on one side of the axis than on the other, and he gives evidence that this departure from symmetry takes place in a direction fixed in space. The statement made by several observers that there is a connection between sun-spots and the sun's corona has induced the author to look carefully over photographs and drawings of the corona made during the last eight eclipses. He has found that during this time the general outline has varied gradually and systematically in a cycle corresponding to that of the sun-spots. The following hypothesis, which seems to account for many facts, was brought forward by the author. A meteor stream is circulating round the sun in a very eccentric orbit. A number of meteors in their perihelion passage are falling into the sun, owing to the increased chances of collision amongst themselves, disintegration owing to rise of temperature and entry into the solar temperature. The local increase of temperature caused by the fall must give rise to currents on the surface of the sun, and may give rise to cyclones which we call sun-spots. If the meteors have a period, so that every eleven years an increased quantity passes the perihelion, a greater number of sun-spots would form, and at the same time we should observe a difference in the shape of the corona, which may well be of such a nature as is actually observed. Dr. Schuster also exhibited to the Society Grant's small calculating machine, for the multiplication of eight figures by eight; he explained its construction, and compared it with that of Thomas of Colmar, which is in general use. Grant's machine is much smaller than Thomas's, but does not perform subtraction directly, as is the case with the latter.

BOSTON, U.S.A.

American Academy of Arts and Sciences, December 11, 1878.—Hon. Charles Francis Adams in the chair.—Prof. Alexander Graham Bell presented a paper upon the use of the telephone in tracing equi-potential lines and surfaces. The results of previous observers, especially those of Prof. Adams, were referred to, and Prof. Bell showed that these lines could be traced more readily with a telephone than with a galvanometer. He made use of a steel-band telephone, which could be clasped about the head, leaving the hands free to perform the experiments. In this way the lines were traced in solids and liquids. By the use of metal exploring rods the equi-potential lines could be traced in the earth about one's feet, or in the neighbourhood of metallic deposits, and might lead to the discovery of metallic deposits or peculiarities in the homogenity of the earth.—Prof. John Trowbridge read a paper upon the results of measurements conducted by himself and Prof. W. H. Hill, of the United States Torpedo Station, at Newport, R.I., upon the heat produced by the rapid magnetisation of iron, nickel, and cobalt. The nickel and cobalt contained from $\frac{2}{10}$ to $\frac{6}{10}$ of 1 per cent. of iron, which was inappreciable in the electro-dynamic experiments. The work done was measured in metre grammes, and gave the result that the molecular heating of equal volumes of iron, nickel, and cobalt can be expressed in metre grammes as follows:—Iron = 2381·43, cobalt = 1906·50, nickel = 1112·11.

PARIS

Academy of Sciences, December 16, 1878.—M. Fizeau in the chair.—The following papers were read:—Observations on M. Pasteur's note on alcoholic fermentation, by M. Berthelot. He describes an arrangement he made for effecting simultaneous

hydrogenation and oxygenation of sugar (by electrical means); he notes that there was a slight production of alcohol.—Study of ordinary and compound engines, &c. (continued), by M. Ledieu.—Report on Mr. Wharton's marine compass, with needle of nickel. Its trial in the navy is recommended.—On the reptiles of primary times, by M. Gaudry. This relates to permian fossils found at Autun. In the vertebræ of Actinodon the parts of the centrum, already in great part formed, but not united, indicate the passage of the imperfect vertebrate to the perfect. M. Gaudry refers to two new reptiles, *Pleuronomia pellati* and *Euchyrosaurus rochei;* the latter's name indicates the fact of its having been more adroit with its fore-limbs than reptiles of the present.—Reply to M. Sire's observations on a gyroscopic apparatus, by M. Gruey.—On a new phenomenon of static electricity, by M. Duter. He repeated his experiment, with vessels of the same volume, but with different thicknesses of glass. The variations of volume were nearly in inverse ratio of the squares of the thicknesses.—Artificial production of nepheline and amphigene, by the method of igneous fusion and reheating at a temperature near fusion, by MM. Fouqué and Levy. —Third note on vaccinal infection; elaborative *rôle* of the lymphatic ganglions, by M. Raynaud.—The memoir by Sadi Carnot, "Reflexions sur la Puissance motrice du Feu," published in 1824, and regarded as the origination of the new science of thermodynamics, had very little publicity. His brother, M. H. Carnot, has issued a new edition, with notes (hitherto unpublished), which show that S. Carnot foresaw, with much distinctness, the consequences that would result from his ideas. A copy of the work, with the MS., was presented to the Academy.—M. Mouchez presented drawings of heavenly bodies, by M. Trouvelot (United States).—On the solar spots and protuberances observed with the equatorial of the Roman College, by P. Ferrari. Little more than two tables relating to the second half of 1877.—On the summation of series, by M. André.—On elimination, by M. Mansion.—On the different properties of the mode of distribution of an electric charge on the surface of an ellipsoidal conductor, by M. Boussinesq.—On the spectrometric measurement of high temperatures, by M. Crova. Take, as term of comparison, the flame of a moderator lamp, and let it be 1,000 on the (arbitrary) optical scale of temperature. Then measure with the spectrophotometer the ratio of the intensities of two radiations λ and λ' in the source of unknown temperature and in the lamp-flame. The quotient of these two ratios will be above or below 1,000 according as the temperature of the source in question is above or below that of the lamp-flame. M. Crova gives several examples of his measurements, and thinks the method applicable to measuring the temperature of the sun and stars; also of various industrial hearths.—Specific heat and heat of fusion of palladium, by M. Violle.—Influence of temperature on rotatory magnetic power, by M. Joubert. This relates chiefly to flint (regarding which there has been some discrepancy). M. Joubert finds that the rotatory power increases with rise of temperature, and about $\frac{1}{10}$th of its value, in passing from the ordinary temperature to that of fusion. His methods are described. He succeeded also in measuring the rotation in a body under the sole influence of terrestrial magnetism alone.—On the densities and the coefficients of dilatation of liquid chloride of methyl, by MM. Vincent and Delachanal.—On the oxidation of some aromatic derivatives, by M. Etard.—On the nature of certain accessory crystallised products, in industrial treatment of petroleums of Pennsylvania, by MM. Prunier and David. These rank parallel (mostly) with those extracted from coal oils or derivatives by pyrogenation from benzine.—Researches on urea, by M. Picard.—On hæmocyanine, a new substance from the blood of the poulp, by M. Fredericq. This contains copper, and seems to play a similar *rôle* in respiration to the hæmoglobine in vertebrates.—Influence of different colours of the spectrum on development of animals, by M. Yung. The experiments were on eggs of frog, trout, and Lymnea. Violet is the most favourable light, next comes blue, then yellow and white; red and green seem hurtful. Darkness does not prevent development, but retards it.

December 23, 1878.—Explosion of fuze materials, by M. Dupuy de Lome. This relates to a recent accident to M. Zédé when experimenting with a mixture of gun-cotton and nitrate of ammonia. The mode of combustion suddenly changed under a very slight increase in the tension of the gas.—Formation of leaves and order of appearance of their first vessels in Gramineæ, by M. Trecul.—Craniology of the Papuan race, by M. de Quatrefages. A *résumé* of the seventh volume of his and M. Hamy's work, "Crania Ethnica."—Experiments on the movements of liquid molecules of current waves, considered in their mode of action on the progress of ships, by M. de Caligny.—Mr. Norman Lockyer communicated his paper recently read to the Royal Society.—M. Damon was elected free member, in place of the late M. Belgrand.—On a process for measuring with precision the variations of level of a liquid surface, by M. le Chatelier. A point immersed in the liquid is raised gradually till its extremity is tangent to the surface. The moment at which this is passed is indicated by deformations of the liquid surface, and these deformations are observed by means of light thrown on the surface, reflected, and observed with a lens, the focal plane of which passes through the end of the point. So long as the point is under water one sees a circle uniformly illuminated, but immediately the point emerges a black spot appears in the circle. The method gives very delicate measurements, and one application designed is a very sensitive manometer for detecting weak currents of air (as in mines). —On the determination of the imaginary roots of algebraic equations, by M. Farkas.—On the theory of perturbations of comets, by M. Mathieu.—Results of solar observations during the third quarter of 1878, by M. Tacchini. The calm was increased. Of 100 days of observation, 90 were without spots. He thinks the minimum will probably be passed in 1879. In the zones of maximum frequence of the protuberances there is a minimum of the faculæ, and *vice versâ*. There is a difference in distribution of the protuberances at the epochs of maximum and minimum of spots. There were no metallic eruptions or elementary spectra, &c.—On a new thermograph, and on a general method of integration of any numerical function, by MM. Pictet and Cellerier. Knowing the tension of a vapour, one may determine *à priori* the corresponding temperature.—Magnetic rotation of the plane of polarisation of light under the earth's influence, by M. Becquerel. M. Joubert's experiment was a repetition of M. Becquerel's.—On a new phenomenon of static electricity, by M. Duter. He repeated M. Govi's experiment with mercury (which had left doubts), and got contraction as in other cases.—On four singular epochs of the annual course of meteorological elements, by M. Ragona.—Preparation of cobaltocyanide of potassium and some derivatives, by M. Descamps.—Action of trimethylamine on sulphide of carbon, by M. Bleunard. He describes some of the properties of sulphocarbonate of trimethylamine, and its combinations with the mineral acids.—On the chromatic function in the poulp, by M. Fredericq. The changes of colour in the animal's skin are analogous to those produced by the vaso-motors in the human face; they express various emotions, especially anger or fear. The deep coloured phase represents the state of activity of the muscles of the chromatophores; the phase of decoloration, the passive state of retraction of these bodies.—On the excretory apparatus of *Solenophorus megalocephalus*, by M. Poirier. Previous accounts he finds erroneous.—New researches on suspension of the phenomena of life in the embryo of the hen, by M. Dareste. A continuation of his former experiments, but with use of different temperatures. The results were conformable to what he expected.—On the tertiary strata of Britanny.

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